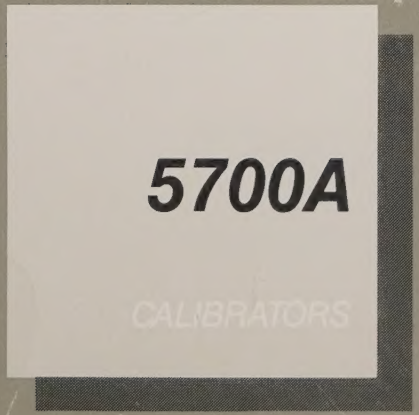
GETTING STARTED

A Guide For New Users



FLUKE

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G E T T I N G S T A R T E D

A Guide For New Users

5700A

CALIBRATOR

FLUKE

CONTENTS

START WITH THIS BOOK if this is your first experience with the Fluke Model 5700A Calibrator. This book contains all the information you will need for a successful first encounter. It contains examples of commonly used functions so you can become familiar with your 5700A and see results quickly. For complete operating instructions, refer to the 5700A Operator Manual. This guide is not intended to replace your Operator Manual.

Enjoy your new 5700A Calibrator!

P/N 791962
September 1988

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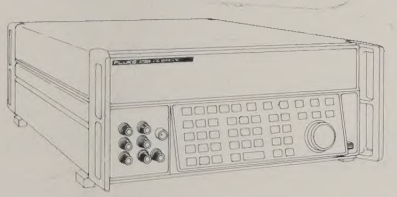
THE 5700A CALIBRATOR



Congratulations on your purchase of a Fluke 5700A Calibrator. You will find it to be a powerful and reliable tool. The 5700A offers:

☐ Powerful capabilities. It covers virtually every meter in your workload with:

DC and AC voltage to ± 1100V
Current to 2.2A
18 fixed resistances

☐ With the optional Wideband AC module, you can extend that workload to include many rf voltmeters.

With the 5725A Amplifier you can extend it further to include the higher current ranges of many bench and handheld meters, as well as the higher volt-hertz corners of some laboratory instruments.

It includes all the standard interfacing you need for connecting amplifiers, phase controls, and automated systems use.

THE 5700A CALIBRATOR

☐ Ease of use:

Numeric keypad and English language displays. Test multiples of any value with [x10] and [÷10] keys. Determine meter errors easily with the magnetic detented adjustment knob and error display. Simplify linearity testing with [OFFSET] and [SCALE] keys.

☐ Low cost of ownership:

Internal check standards simplify calibration adjustments, dramatically reducing your costs for maintaining traceability.

Environmental tolerance lets you easily calibrate meters in place.

THE 5700A CALIBRATOR

Many 5700A capabilities are not mentioned in this guide. As you become familiar with the 5700A Calibrator, you will find the 5700A Operator Manual to be a valuable reference tool. Numerous examples and illustrations are arranged so you can quickly find what you want to know.

To do the exercises in this guide, you will need a multimeter such as a Fluke 70 Series or 8840A.

Fluke 5440A-7002 Low Thermal EMF Test Leads are recommended. Information is also included on remote operation by an IEEE-488 Bus controller. To do that portion of these exercises, the meter must have IEEE-488 bus capability. You will also need an instrument controller such as the Fluke 1722A.

THE FRONT PANEL

Output Display

Always shows the true output value (or selected output value if in standby). Annunciators show whether the 5700A is in operate or standby mode.

Softkeys

Perform various functions as defined by the labels that appear on the Control Display above each softkey. The PREV MENU softkey recalls the previous set of menu choices.

Control Display

Defines softkey functions, displays meter error information, shows status messages, and prompts you during 5700A calibration.

BOOST

Selects output through an attached amplifier. (Amplifier operation is normally automatic.) 5725A ac voltage output is available at the 5700A OUTPUT binding posts.

W BND

Selects the Option 5700A-03 Wideband AC Module. Moves the output location to the WIDEBAND Type "N" connector.

EX GRD

Selects external guard when lit, or internally connects the V GUARD to OUTPUT LO when off.

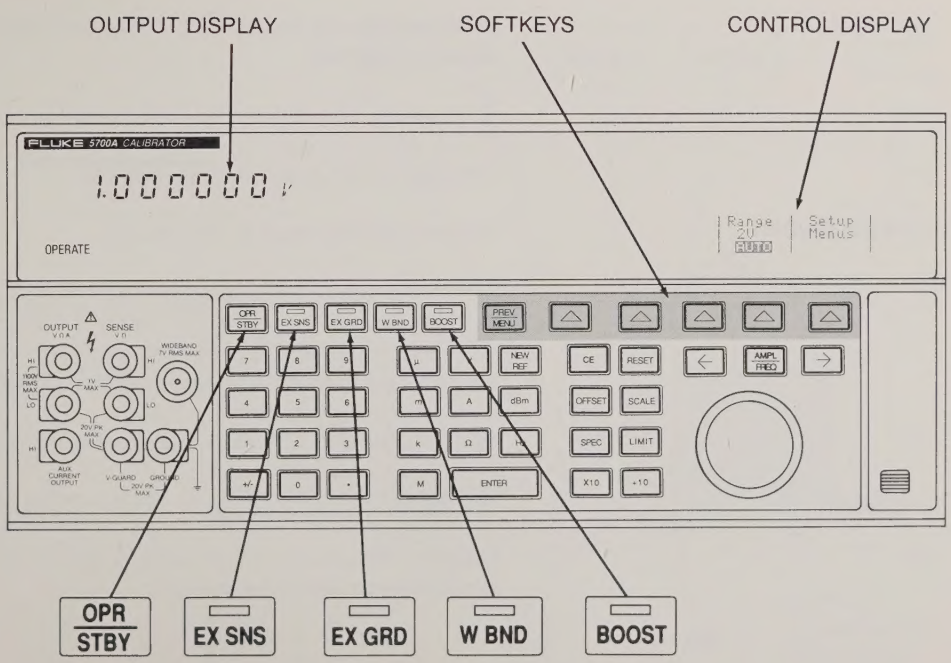
EX SNS

Selects external sensing when lit, or internally connects SENSE to OUTPUT when off. When the indicator is off, the SENSE binding posts are open-circuited.

OPR STBY

Toggles the operating state between operate and standby.

THE FRONT PANEL



THE FRONT PANEL

OFFSET and SCALE

Compensate for meter zero offset and scale error for direct display of meter linearity errors.

CE

Clear entry. Use this key to clear partial entries after making an error.

RESET

Sets the 5700A to 0 mV dc in standby.

POWER Switch

Applies and removes ac line power.

← AMPL FREQ →

Adjust the output and activate the automatic error calculation mode for reading the error of a meter. ← and → select a higher or lower order digit for adjustment. AMPL FREQ selects amplitude or frequency for adjustment. The output adjustment controls also serve as phase controls for the variable phase output function.

LIMIT

Displays, selects and stores your selected output limits.

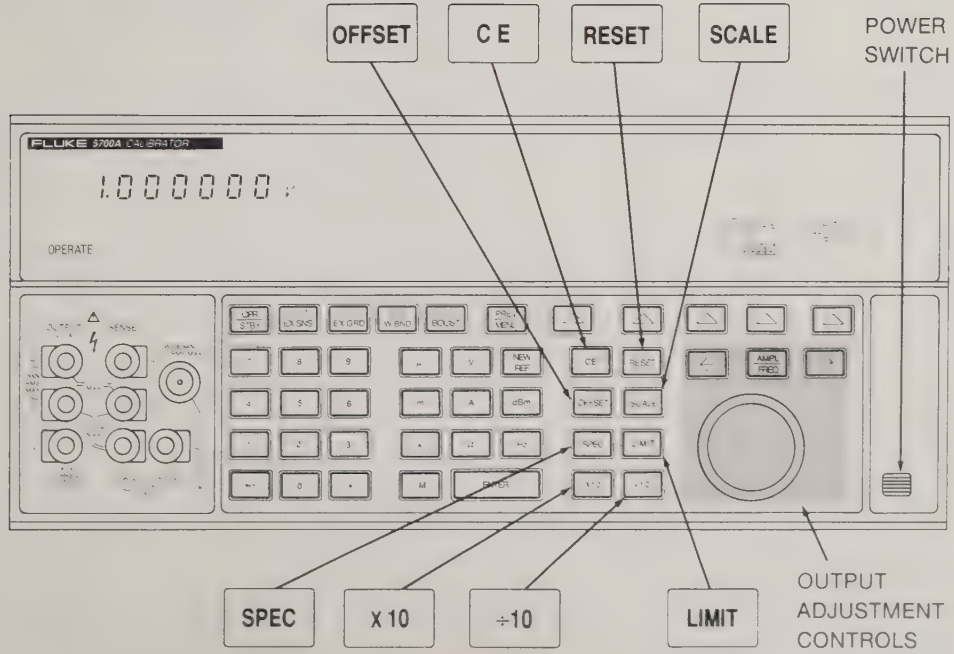
X10 and ÷10

Set the output to ten times or one tenth the present output value.

SPEC

Displays the absolute uncertainty for the present output, calculated for your preselected calibration interval.

THE FRONT PANEL



THE FRONT PANEL

NEW REF

When in error mode, pressing NEW REF sets the present output as a new reference for meter error testing.

ENTER

Confirms an entry, instructing the 5700A to accept it. If the entry is an output change, it moves from the Control Display to the Output Display. ENTER switches the 5700A to standby if the new output meets any of the following conditions:

- ☐ Changes between voltage, current, or resistance
- ☐ Changes a voltage output from below 22V to over 22V
- ☐ Changes the output location

Function Keys

Used with the numeric keypad, these keys select the output function.

Multiplier Keys

Used with the numeric keypad, these keys select multipliers of μ (micro or 10^{-6}), m (milli or 10^{-3}), k (kilo or 10^{3}), or M (mega or 10^{6}).

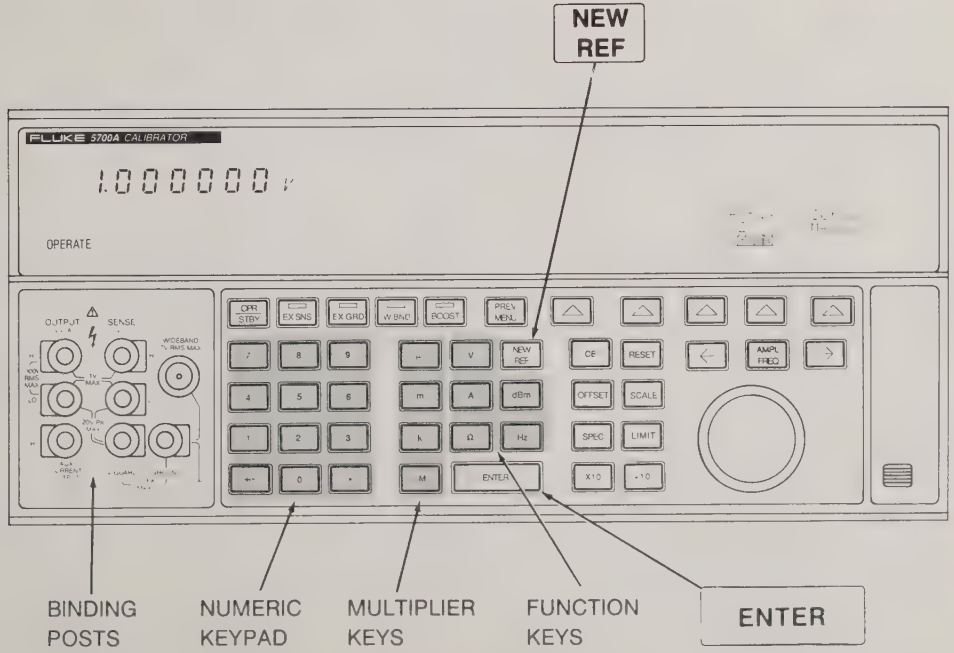
Numeric Keypad

Provides direct input of amplitudes and frequencies. Entries accumulate on the Control Display until you press CE or ENTER.

Binding Posts

Provide output and sensing connections. The exercises in this guide use the OUTPUT HI, OUTPUT LO, V GUARD, and GROUND binding posts.

THE FRONT PANEL



THE REAR PANEL

Fan Filter

The filter keeps dust and debris out of the chassis. Fans inside the 5700A provide a constant cooling air flow throughout the chassis.

Amplifier Interface Connectors

Provide analog and control interfaces for Fluke 5725A, 5205A/5215A, and 5220A amplifiers.

VARIABLE PHASE OUT Connector

Provides an adjustable-phase nominal 2.5V rms sine wave reference output signal.

PHASE LOCK IN Connector

An input connector for an external signal onto which the 5700A can phase lock.

Rear Binding Posts

Alternative connections to the UUT (Unit Under Test). An internal cable enables either the front or rear binding posts. (This is a Technical Service Center procedure.)

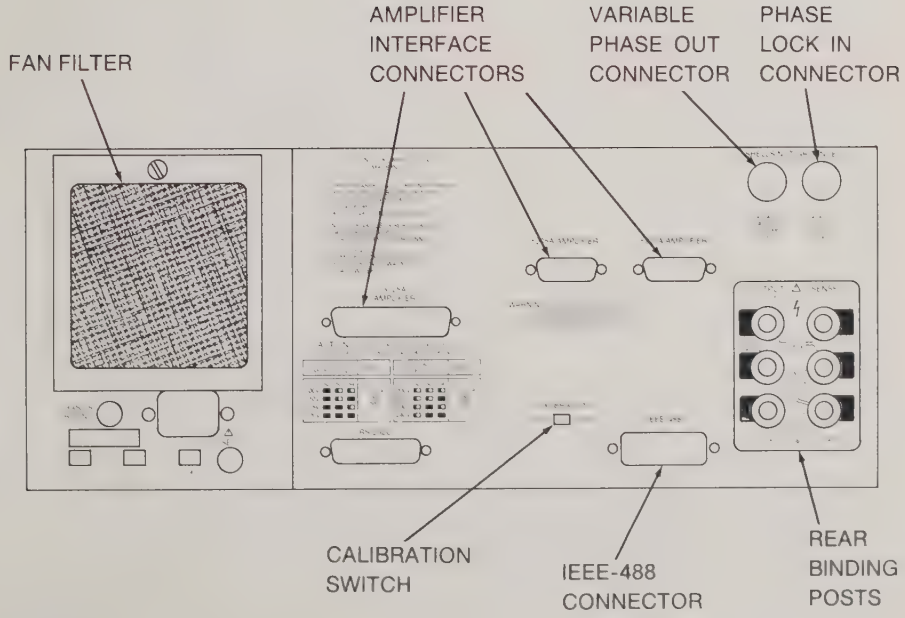
IEEE-488 Connector

A standard interface connector for remote 5700A operation on the IEEE-488 bus.

CALIBRATION Switch

Enables and disables the nonvolatile memory for storing new calibration constants and dates. The switch must be in the ENABLE position to change the setting of the date.

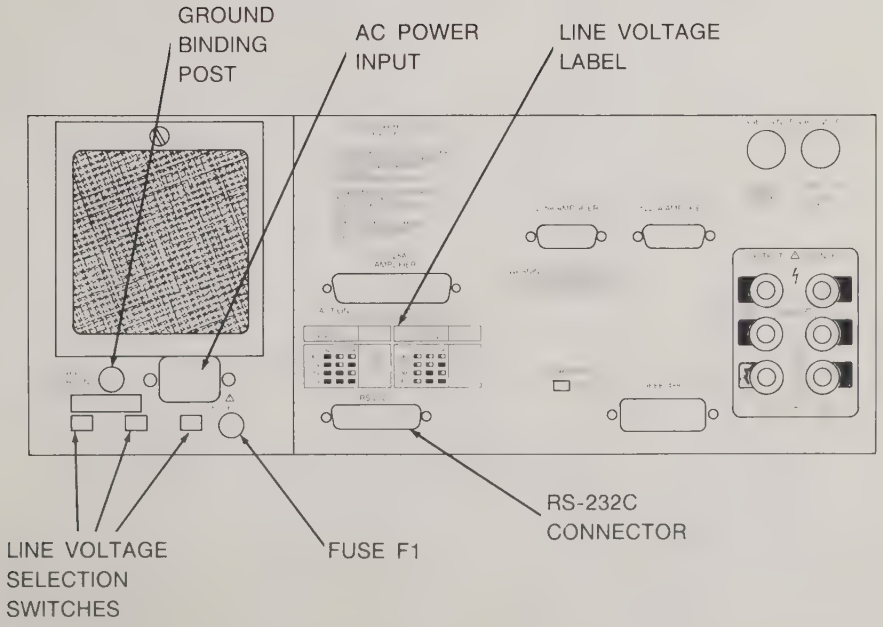
THE REAR PANEL



THE REAR PANEL

GND Binding Post	The GND binding post is internally grounded to the chassis and the ground lead of the line power cord.
AC PWR INPUT	A male three-prong connector that accepts the line power cord. The 5700A should be grounded by attaching a properly-grounded line power cord.
Line Voltage Label	Shows the various settings of the line voltage switches and the correct replacement fuse ratings for fuse F1 for operating voltages of 110 (90 through 132) and 220 (180 through 264) volts ac.
RS 232C Connector	A standard male RS-232-C DTE connector for transmitting internal calibration constant data to a printer, monitor, or host computer, and for connecting to a terminal or computer for remote control of the 5700A.
FUSE F1	The line power fuse.
Line Voltage Selection Switches	These switches select the operating line voltage. Their correct settings are shown on the line voltage label.

THE REAR PANEL



CONNECT TO LINE POWER

Check the Line Power Setting

Before you turn on the 5700A, check to see that the line voltage selection switches are set to the correct settings and that the correct fuse is installed (see facing page).

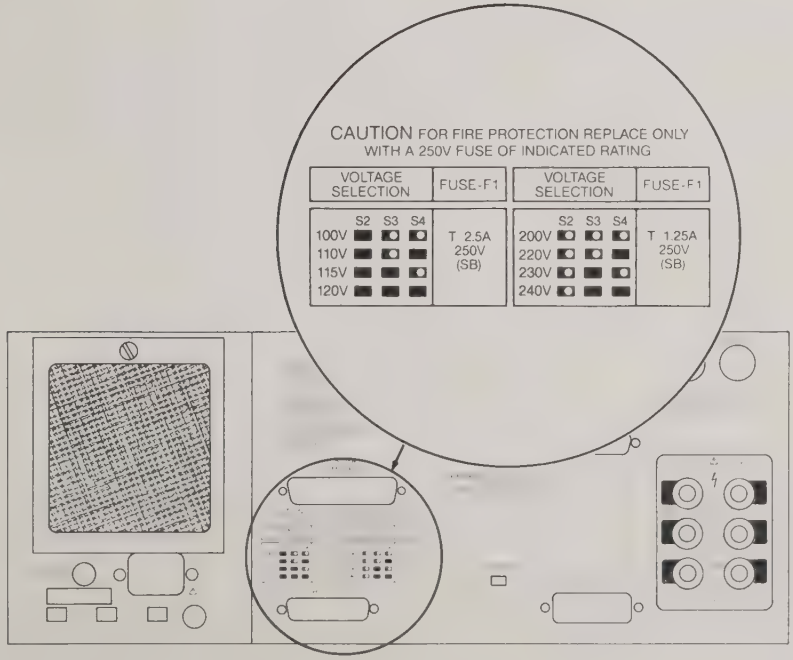
Connect the Line Power Cord

WARNING

TO AVOID SHOCK HAZARD, CONNECT THE FACTORY SUPPLIED THREE-CONDUCTOR LINE POWER CORD TO A PROPERLY GROUNDED POWER OUTLET. DO NOT USE A TWO-CONDUCTOR ADAPTER OR EXTENSION CORD; THIS WILL BREAK THE PROTECTIVE GROUND CONNECTION.

Connect the line power cord to the power connector on the rear panel of the 5700A and to a grounded ac outlet.

CONNECT TO LINE POWER



CONNECT TO LINE POWER

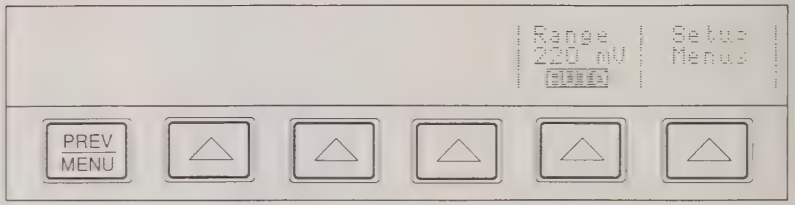
Turn on The 5700A

WARNING

DO NOT TOUCH THE OUTPUT TERMINALS. THE 5700A CALIBRATOR IS CAPABLE OF SUPPLYING LETHAL VOLTAGES AT THE OUTPUT TERMINALS. USE CAUTION WHEN OPERATING.

Apply Power

After the 5700A passes all self tests, it is set to 0V dc in standby, configured for internal sensing and internal guard, ready to accept an entry from the keypad. The Control Display now looks like this:



CONNECT TO LINE POWER

Warm Up the 5700A

When you first turn the 5700A on, you should normally warm it up for 30 minutes to allow the environmentally-controlled components inside to stabilize. This ensures that the 5700A meets or exceeds the specifications. If you turn off the 5700A after it has warmed up, allow it to warm up again for at least twice the length of time it was turned off (up to a maximum of 30 minutes of warm-up). For example, if the 5700A is turned off for 10 minutes, allow it to warm up again for at least 20 minutes.

You will not hurt anything by proceeding with the exercises in this guide without warming the 5700A up. The 5700A might not be as accurate.

CONNECT TO LINE POWER

Run DC Zeros Calibration

DC zeros is a 15-second automatic internal process that removes the offset error on the 2.2V range. The specifications require that dc zeros be run every 30 days. To run dc zeros, proceed as follows from the power-up state:

1. Press the following sequence of softkeys:

   "Setup Menus" → "Cal" → "Zero"

   (Softkeys are identified by the labels on the display directly above the keys.)

2. When the process is finished, a message appears that tells you to press any key to continue. Press any key.

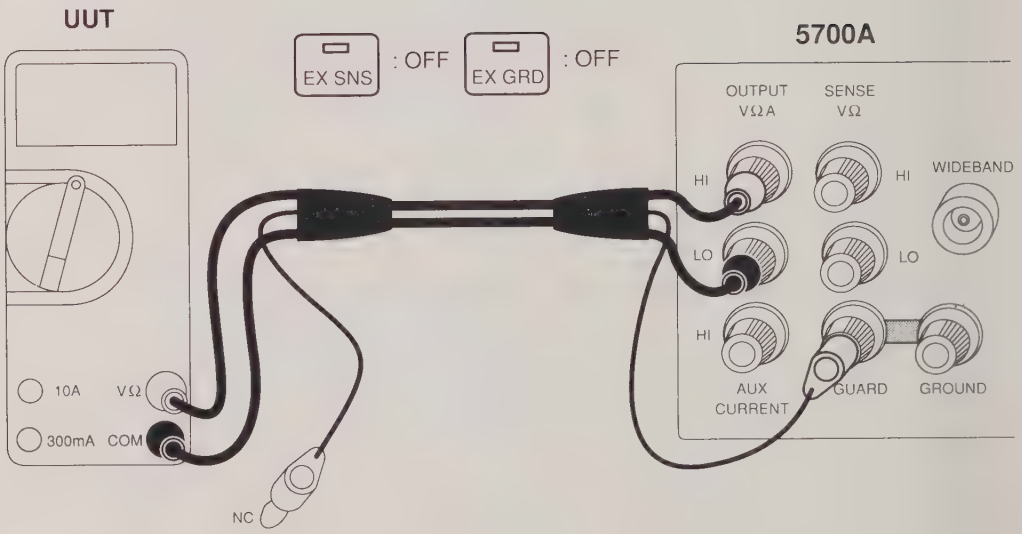
3. To go to normal operation, press PREV MENU twice.

CONNECT A METER

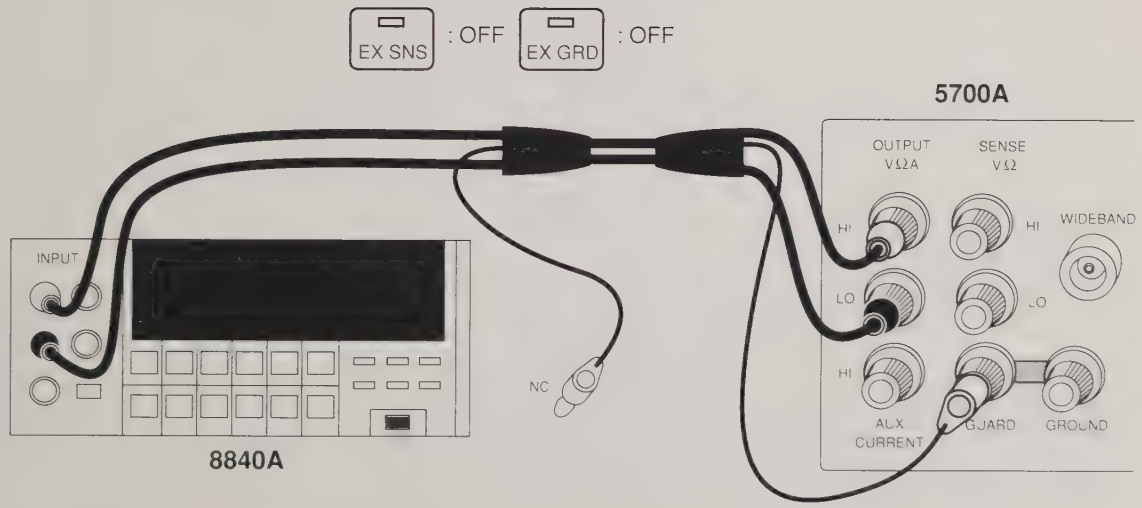
Typical connections for Fluke 77 and 8840A meters are shown below. To connect either type of meter, proceed as follows:

1. Verify that the 5700A is turned on, and is in standby mode (STANDBY indicator lit). If the 5700A is not in standby, press RESET .
2. Set the multimeter to the lowest range that reads 10V dc.
3. Connect the shield lead of the cable set to V GUARD.
4. Verify that both EX SNS and EX GRD indicators are off.
5. Connect the meter input LO to the 5700A OUTPUT LO.
6. Connect the meter input HI to the 5700A OUTPUT HI.

CONNECT A METER



CONNECT A METER



OPERATE FROM THE FRONT PANEL

Apply a DC Voltage

Set the meter so that it can read 10V dc and apply 10V dc to the meter terminals by pressing the following sequence of keys:

Notice that the Output Display shows the output value you have selected, and the OPERATE annunciator is lit, showing that the output is active. The Control Display shows the range currently selected (11V) and presents a softkey that gives you the choice of locking in this range or leaving autoranging active. Another softkey is available to call up setup menus.

Check the 5700A Uncertainty

Press SPEC . The total uncertainty for the 10V you are applying to the meter is displayed on the Control Display. This number depends on which calibration cycle your 5700A is set to in a setup menu: 24 hours, 90 days, 180 days, or 1 year. The 5700A is shipped with the cal interval set to 1 year. The Operator Manual tells how to change it. Press PREV MENU to clear the uncertainty display.

Activate Error Mode

Chances are the meter connected to the 5700A reads a value other than exactly 10V. To quickly read the total error of the meter, turn the rotary knob to obtain a meter reading of exactly 10V and read the error off the Control Display.

Turning the knob is all it takes to activate error mode. When you turn it, the least-significant digit is highlighted. This digit changes as you turn the knob. If you need to make a large change, press ← as many times as desired to highlight a higher-order digit.

When you are finished adjusting the output, the Control Display shows the error of the meter in ppm (parts per million) or percent of output, depending on the magnitude of the error.

NOTE

The error shown on the Control Display is a combination of offset, scale, and linearity errors. The 5700A breaks errors down into their component parts if you use the OFFSET and SCALE keys. Section 4 of the Operator Manual explains how to do this, and gives a tutorial on basic types of meter errors.

OPERATE FROM THE FRONT PANEL

Check the Meter Error on Higher and Lower Ranges

To check the meter error at 100V dc, first set the meter range (if applicable) for 100V dc. Press x10 then OPR/STBY on the 5700A. This sets a new reference equal to ten times the previous reference of 10V dc. (Pressing OPR/STBY was necessary because the 5700A goes into standby when it crosses the safety threshold from below 22V to over 22V.) Turn the rotary knob to re-activate error mode and determine the meter error at 100V.

Press ÷10 ÷10 . Set the meter range switch (if applicable) to the lowest range that reads 1V. Turn the rotary knob to re-activate error mode and determine the meter error at 1V.

To end the error mode session, press ENTER . This recalls the reference value and exits error mode.

Press RESET to set the output to 0mV dc in standby.

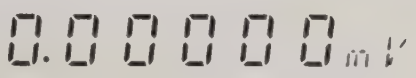
OPERATE FROM THE FRONT PANEL

Apply an AC Voltage

There is no "ac mode" switch on the 5700A. You change a dc output to ac by keying in a frequency. To do this, you key in a number, optional multiplier, Hz, then press ENTER. To test the meter at 10V at 1 kHz, press OPR/STBY to set the 5700A to standby, then set the meter to the ac V mode. On the 5700A, press 1 0 V then 1 k Hz ENTER OPR/STBY. Test the accuracy of the meter by adjusting the output with the knob for a reading of exactly 10V.

The rotary knob is a convenient way to change the frequency during frequency response testing. To test the meter's frequency flatness, press AMPL/FREQ. The 0.1 Hz digit of the frequency line is highlighted. Press ← four times. Now when you turn the knob, the frequency increases or decreases 1 kHz per knob click. Turn the knob until the Output Display shows 10 kHz. Press AMPL/FREQ, and turn the knob to check the accuracy of the meter at 10 kHz. Wait for the 5700A output to settle (the "U" annunciator will go out) at each new frequency.

This ends the front panel operation exercise. To zero the output and go to standby, press RESET. Verify that the Output Display now appears as shown below.



STANDBY

OPERATE IN REMOTE

The IEEE-488 Interface

The IEEE-488 Interface makes the 5700A a fully-programmable systems instrument for remote operation over the IEEE Standard 488.1 interface bus. The 5700A operates in two remote modes: normal 5700A mode and 5100B emulation mode. Use 5700A mode unless you want to replace a 5100B with a 5700A in an automated system.

The 5700A is classified as a talker / listener on the bus, which means it responds to queries and commands from a controller on the bus. Queries generate a response message from the 5700A, such as asking for the setting of the 5700A output. Commands generate an action in the 5700A, such as setting a specific voltage output.

If you do not have an IEEE-488 instrument controller, you may still be able to operate the 5700A in remote. The 5700A also has the ability to receive remote commands through the serial port. This allows you to use a terminal or microcomputer with an RS-232 port to act as controller for the 5700A. Section 5 of the 5700A Operator Manual gives instructions on how to remotely control the instrument via the serial port.

Connect to the IEEE-488 Bus

The following procedure is an exercise in remote operation. To do the exercise you first need to connect the 5700A and meter to the IEEE-488 bus and set the bus addresses on both instruments.

If you are using a Fluke 1722A Controller and 8840A DMM, proceed as follows to set up the 5700A on the IEEE-488 bus:

1. Turn off the 5700A and 8840A power.

2. Attach an IEEE-488 cable to the rear panel IEEE-488 connector and attach the other end to the 1722A. Attach another IEEE-488 cable between the 5700A and the 8840A. It is recommended that you use Fluke shielded cables Y8021, Y8022, or Y8023, in lengths of 1, 2, or 4 meters, respectively, for this purpose.

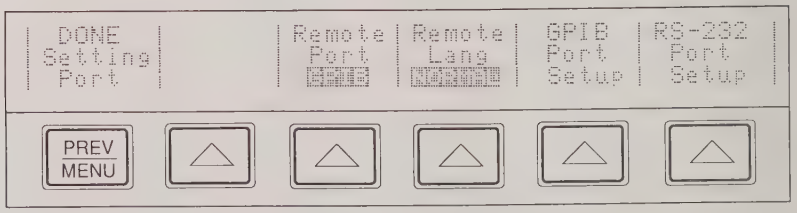
3. Turn on the 5700A and 8840A power.

OPERATE IN REMOTE

4. Press the following sequence of softkeys:

   Setup Menus → Instmt Setup → Remote Port Setup

   The display changes to:



5. Verify that the settings for Remote Port and Remote Lang on the Control Display are the same as those shown above. If the settings are not the same, change them to match by pressing the appropriate softkeys.

6. Press the "GPIB Port Setup" softkey. The GPIB port setup menu appears:

7. Verify that the address is set to 4. Change it if necessary.

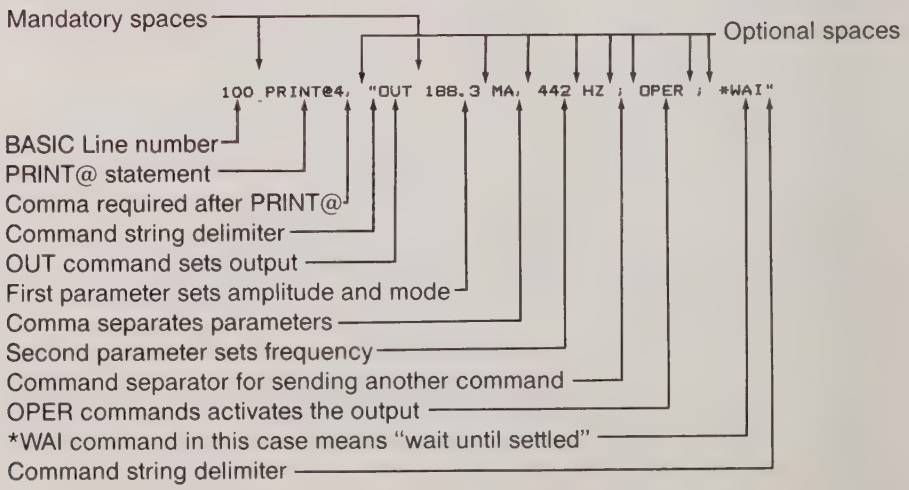
8. Press the DONE Setting Port softkey.

9. Set the 8840A bus address to 1.

OPERATE IN REMOTE

Typical BASIC Program Statement

Here is a program statement as it might be sent from a Fluke 1722A Instrument Controller. This statement sets the 5700A to 188.3 mA at 442 Hz, activates the output, then waits until the output is settled before continuing. The PRINT@ statement automatically sends the proper interface messages (ATN and MLA) and terminators (LF with EOI) to the 5700A and the end of the statement. You could also send this program statement without a line number as a 1722A BASIC immediate mode command string.


Mandatory spaces
Optional spaces
100 PRINT@4, "OUT 188.3 MA, 442 HZ ; OPER ; *WAI"
BASIC Line number
PRINT@ statement
Comma required after PRINT@
Command string delimiter
OUT command sets output
First parameter sets amplitude and mode
Comma separates parameters
Second parameter sets frequency
Command separator for sending another command
OPER commands activates the output
*WAI command in this case means "wait until settled"
Command string delimiter

Program Example

The following program was written in Fluke BASIC for the 1722A Instrument Controller. This program selects 10V dc output, verifies that the 5700A is set to 10V, then triggers an 8840A to take a reading. It displays 5700A output, 8840A reading, and the meter error in ppm. The program assumes that the 5700A bus address is 4 and the 8840A bus address is 1.

```
10  REM  THIS PROGRAM VERIFIES THE ACCURACY OF AN 8840A AT 10V DC
20  INIT PORT 0                          ! INITIALIZE THE INTERFACE
30  CLEAR PORT 0                         ! "
40  PRINT @1, "F1 R0 S0 T2"              ! SET 8840A FOR VDC, SLOW READ, AUTORANGE
50  PRINT @4, "OUT 10 V ; OPER"          ! SET THE 5700A TO 10V DC,
60  PRINT @4, "*WAI; OUT?"               ! WAIT FOR SETTLE, REQUEST THE OUTPUT VALUE
70  INPUT @4, V,U$,F                     ! GET THE DATA FROM THE 5700A
80  PRINT @1, "?"                        ! TRIGGER THE 8840A TO TAKE A READING
90  INPUT @1, VM                         ! GET THE DATA FROM THE 8840A
100 ER = (ABS(V - VM)/V) * 1E6           ! COMPUTE ERROR
110 PRINT "5700 OUTPUT:   ";V;U$         ! PRINT THE RESULTS
120 PRINT "8840 MEASURED: ";VM;"V"       ! "
130 PRINT "ERROR:         ";ER;"PPM"     ! "
140 END
```

Section 5 of the 5700A Operator Manual contains documentation for all 5700A remote commands.

Other Controllers

Every controller handles IEEE-488 commands somewhat differently. If you are using a controller other than the 1722A, refer to your controller's programming manual for details.

ABOUT THE 5700A OPERATOR MANUAL

The 5700A Operator Manual

The 5700A Operator Manual provides complete information for installing and operating the 5700A. This manual also provides a glossary of calibration-related terms as well as some general items such as specifications and error code information. Topics in the 5700A Operator Manual include:

- Installation
- Operating controls and features
- Front panel operation
- Remote operation
- Serial data output (printing, displaying, and transferring data)
- Operator maintenance including calibrating the 5700A
- Options and accessories

The 5700A Operator Manual includes two pocket-sized reference booklets; one for front panel operation and one for remote programming.

ABOUT THE 5700A OPERATOR MANUAL

5700A Operator Reference Guide

The 5700A Operator Reference Guide contains a summary of operating instructions from the Operator Manual. This reference guide contains information needed to start up and operate the 5700A. It contains a front and rear feature reference and a softkey menu tree. The guide is included with the 5700A Operator Manual.

The 5700A Remote Programming Reference Guide

The 5700A Remote Programming Reference Guide contains a summary of remote commands for the 5700A. It also contains information needed to determine system status using the status byte and registers. This reference guide is also included with the 5700A Operator Manual.

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